APPENDIX

to

Utility Patent Application

for

Light-Activated Adhesive Composite, System, and Method of Use Thereof (12391-0025)

Data Tables

Chromophore		Concentrations Investigated						
ICG	0.001 mg/mL	0.0025 mg/mL	0.005 mg/mL	0.0075 mg/mL	0.01 mg/mL			
MB	0.001 mg/mL	0.0025 mg/mL	0.005 mg/mL	0.0075 mg/mL	0.01 mg/mL			
RFC #40	0.5 μL per	5 μL per 1 μL per		10 μL per	20 μL per			
	13 mL	13 mL	13 mL	13 mL	13 mL			
BFC #1	0.5 μL per	1 μL per	5 μL per	10 μL per	20 μL per			
	13 mL	13 mL	13 mL	13 mL	13 mL			
GFC #5 & #1	0.5 μL per	1 μL per	5 μL per	10 μL per	20 μL per			
	13 mL	13 mL	13 mL	13 mL	13 mL			

Table 1: Chromophore concentrations tested in deionized water using cuvettes with a path length of 10mm.

Chromophore		Concentrations Investigated					
ICG	0.1 mg/mL	0.25 mg/mL	0.5 mg/mL	0.75 mg/mL	1.0 mg/mL		
MB	0.1 mg/mL	0.25 mg/mL	0.5 mg/mL	0.75 mg/mL	1.0 mg/mL		
RFC #40	200 μL per	μL per 400 μL per		800 μL per	1000 μL per		
	13 mL	13 mL	13 mL	13 mL	13 mL		
BFC #1	200 μL per	400 μL per	600 μL per	800 μL per	1000 μL per		
	13 mL	13 mL	13 mL	13 mL	13 mL		
GFC #5 & #1	200 μL per	400 μL per	600 μL per	800 μL per	1000 μL per		
	13 mL	13 mL	13 mL	13 mL	13 mL		

Table 2: Chromophore concentrations tested in deionized water using cuvettes with a path length of 0.15 mm.

Chromophore		Concentrations Investigated					
ICG	0.1 mg/mL	0.25 mg/mL	0.5 mg/mL	0.75 mg/mL	1.0 mg/mL		
MB	0.1 mg/mL	0.25 mg/mL	0.5 mg/mL	0.75 mg/mL	1.0 mg/mL		
RFC #40	200 μL per	400 μL per	600 μL per	800 μL per	1000 μL per		
	13 mL	13 mL	13 mL	13 mL	13 mL		
BFC #1	200 μL per	400 μL per	600 μL per	800 μL per	1000 μL per		
	13 mL	13 mL	13 mL	13 mL	13 mL		
GFC #5 & #1	200 μL per	400 μLper	600 μL per	800 μL per	1000 μL per		
	13 mL	13 mL	13 mL	13 mL	13 mL		

Table 3: Chromophore concentrations tested in albumin solder with a path length of 0.8mm.

ICG MB 60 °C 80 °C 100 °C 60 °C 80 °C 100 °C Time Std Std Std Std Std Std Mean Dev Mean (sec) Dev Mean Mean Mean Mean Dev Dev Dev Dev 0 1.852 0.0400 1.852 0.0400 1.852 0.0400 2.237 0.0461 2.237 0.0461 2.237 0.0461 30 1.759 0.0941 1.707 0.0651 0.0487 1.693 2.120 0.0367 2.155 0.0215 2.238 0.0135 2.144 60 1.742 0.0813 1.652 0.0435 1.575 0.0956 0.0248 2.173 0.0353 2.234 0.0244 90 1.630 0.1504 1.670 0.0996 1.577 0.0561 2.049 0.0768 2.126 0.0991 2.204 0.0458 120 1.631 0.0786 1.742 0.0466 1.598 0.0631 2.095 0.0403 2.167 0.0920 2.184 0.0681 180 1.596 0.0376 1.712 0.0612 1.701 0.0576 2.180 0.0340 2.058 0.0948 2.134 0.0429 1.558 240 0.10022.147 1.735 0.0322 1.450 2.219 0.0771 0.0508 0.0156 2.170 0.0828 300 1.763 0.0355 1.714 0.0512 1.335 0.0851 2.145 2.188 0.0860 2.233 0.0366 0.0475

Table 4: Absorbance at peak wavelength recorded when deionized water solutions containing ICG and MB were heated to temperatures of 60, 80, or 100°C for various periods of time.

Table 5A - Temperature of 60 °C

	RFC (500 nm)		BFC (630 nm)	GFC (GFC (417 nm) GFC (630 n		
Time								
(sec)	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
0	4.341	0.01452	3.218	0.01452	2.082	0.06441	1.908	0.06309
60	4.262	0.04338	3.048	0.04338	2.070	0.07668	1.901	0.07236
180	4.185	0.03987	3.134	0.03987	2.070	0.03785	1.909	0.03550
300	4.255	0.01538	3.172	0.01538	2.109	0.00966	1.942	0.01131

Table 5B - Temperature of 100 °C

	RFC (500 nm)		BFC (630 nm)	GFC (417 nm)	17 nm) GFC (
Time								
(sec)	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
0	4.341	0.03215	3.218	0.01452	2.082	0.06441	1.908	0.06309
60	4.320	0.02892	3.012	0.04338	2.014	0.08734	1.842	0.08739
180	4.132	0.08413	3.139	0.03987	2.051	0.04554	1.877	0.05066
300	4.252	0.07630	3.113	0.01538	2.080	0.02587	1.911	0.02584

Tables 5A and 5B: Absorbance at peak wavelength recorded when deionized water solutions containing red, blue and green food coloring were heated to temperatures of 60 °C (Table 7A) or 100 °C (Table 7B) for various periods of time.

Table 6A - Experimental

	Da	ıy 0	1 w	eek	2 w	eeks	4 w	eeks	8 w	eeks	12 w	eeks
		Std		Std	-	Std		Std		Std		Std
	Mean	Dev	Mean	Dev	Mean	Dev	Mean	Dev	Mean	Dev	Mean	Dev
ICG												
(780nm)	2.268	0.0615	0.3020	0.0201	0.2752	0.0239	0.2641	0.0198	0.2788	0.0080	0.1486	0.0471
MB												
(665 nm)	2.337	0.0166	1.722	0.0285	1.184	0.0110	0.3866	0.0216	0.2517	0.0105	0.1395	0.0619
RFC							-					
(500nm)	4.338	0.0338	4.413	0.0841	4.382	0.0741	4.413	0.0292	4.411	0.0579	4.209	0.0479
BFC												
(630nm)	3.650	0.0215	3.624	0.0201	3.579	0.0723	3.592	0.0473	3.649	0.0186	3.557	0.0354
GFC												
(417nm)	2.064	0.0527			2.068	0.0075			2.012	0.0268	1.978	0.0503
GFC	·											
(630nm)	1.758	0.0510			1.766	0.0060			1.698	0.0260	1.673	0.0492

Table 6B - Control

	Da	ay 0	1 w	eek	2 w	eeks	4 w	eeks	8 w	eeks	12 w	eeks
		Std		Std		Std		Std		Std		Std
	Mean	Dev	Mean	Dev	Mean	Dev	Mean	Dev	Mean	Dev	Mean	Dev
ICG												
(780nm)	2.033	0.0731	0.7964	0.0375	0.5252	0.0692	0.2937	0.0745	0.2104	0.0420	n/p	
MB								1				
(665 nm)	2.079	0.0386	2.117	0.0106	2.043	0.0674	1.994	0.0564	1.982	0.0246	2.043	0.0102
RFC												
(500nm)	5.756	0.2767	5.754	0.2098	5.754	0.2906	5.933	0.2655	5.644	0.2922	5.858	0.2648
BFC									***			
(630nm)	2.435	0.0685	2.499	0.0328	2.486	0.0718	2.460	0.0374	2.415	0.0293	2.436	0.0692
GFC												
(417nm)	2.221	0.0268	2.198	0.0503	2.242	0.0255	2.200	0.0389	2.148	0.0283	2.137	0.0724
GFC												
(630nm)	1.885	0.0278	1.857	0.0488	1.904	0.0278	1.864	0.0388	1.804	0.0227	1.792	0.0733

Tables 6A and 6B: Absorbance at peak wavelength recorded when deionized water solutions containing 0.01 mg/mL ICG as MB, and 20 μ L per 13 mL RFC, BFC and GFC, were exposed to white light for a period up to 12 weeks.

Chromophore	Concentrations Investigated					
ICG	0.1 mg/mL	0.25 mg/mL	0.5 mg/mL	0.75 mg/mL	1.0 mg/mL	
MB	0.1 mg/mL	0.25 mg/mL	0.5 mg/mL	0.75 mg/mL	1.0 mg/mL	
BFC (#1)	200 μL	400 μL	600 μL	800 μL	1000 μL	
	per 13 mL	per 13 mL	per 13 mL	per 13 mL	per 13 mL	
GFC (#5 & #1)	200 μL	400 μL	600 μL	800 μL	1000 μL	
	per 13 mL	per 13 mL	per 13 mL	per 13 mL	per 13 mL	

Table 7: Chromophore concentrations tested in chromophore-doped scaffold-enhanced solder.

Chromophore	Peak Absorption Wavelength (nm)	Laser System
ICG	805	5W 808nm
MB	665	400mW 670nm
BFC	630	35mW 632.8nm
GFC	417 and 630	35mW 632.8nm

Table 8: Chromophore absorption wavelengths and the lasers used to irradiate them in this study.

Set	Adhesive Specifications
Set A*	25% BSA(w/v)
(n=10)	□106 µm pore diameter
Set B*	25% BSA(w/v)
(n=10)	106 - 150 μm pore diameter
Set C*	50% BSA(w/v)
(n=10)	□106 µm pore diameter
Set D*	50% BSA(w/v)
(n=10)	106 - 150 μm pore diameter

^{*}All sets used 0.5 mg/ml ICG, 85:15 PGLA, 70% wt. NaCl

Table 9: Adhesive fabrication parameters used in the study.

SPECIMEN#	GROUP A	GROUP B	GROUP C	GROUP D	NATIVE MUSCLI
1	2.5	3.6	3.0	3.6	4.1
2	2.3	3.7	3.8	5.7	6.2
3	2.6	4.3	2.9	4.7	4.9
4	2.7	3.8	2.5	4.5	5.5
5	2.4	3.2	2.7	4.2	4.9
6	2.5	3.9	2.6	4.1	4.9
7	2.5	4.0	2.6	4.7	5.5
8	2.3	3.3	3.4	3.5	4.3
9	2.2	3.4	2.9	3.7	4.3
10	2.7	3.6	3.0	3.6	3.9
MEAN (N)	2.5	3.7	2.9	4.2	4.8
STD DEV	0.17	0.33	0.41	0.69	0.72
% OF NATIVE TISSUE	51	76	61	88	100

Table 10: Maximum tensile strength (in Newton's) of scaffold-enhanced light-activated soldering of transected extraocular rectus muscle-to-extraocular rectus muscle according to adhesive and scaffold parameters outlined in Table 9.

SPECIMEN :	TENSILE STRENGTH (N)
1	2.8
2	2.7
3	3.0
4	2.9
5	2.5
6	2.9
7	3.4
8	3.6
9	2.9
10	2.8
11	2.8
12	2.3
13	2.5
14	2.8
15	2.2
16	2.8
17	2.7
18	3.3
19	3.2
20	3.6
Mean	2.9
St. Dev.	0.37

Table 11: Maximum tensile strength (in Newton's) of scaffold-enhanced light-activated soldering of sclera-to-sclera.

SPECIMEN #	TENSILE STRENGTH (N)
1	3.2
2	3.0
3	2.5
4	3.1
5	2.5
6	3.0
7	3.6
8	3.3
9	3.4
10	2.6
11	3.0
12	3.1
13	2.8
14	2.7
15	2.5
16	3.5
17	3.1
18	3.2
19	2.9
20	3.6
Mean	3.0
St. Dev.	0.36

Table 12: Maximum tensile strength (in Newton's) of scaffold-enhanced light-activated soldering of extraocular rectus muscle-to-sclera.

Example 4:

		Tensile Strength (N))
Specimen	Solder + PLGA	Solder + SIS	Solder Al ne
1	1.4	1.7	0.4
2	2.3	1.4	0.8
3	2.0	2.3	0.6
4	1.4	1.9	1.2
5	1.6	2.2	1.8
6	2.1	1.5	0.9
7	2.0	1.7	1.3
8	1.7	1.6	0.7
Mean	1.8	1.8	1.0
St Dev	0.3	0.3	0.5

TABLE 13

Summarized data can be found in Fig. 10.

		Time-to-Failure (s)	
Specimen	Solder + PLGA	Solder + SIS	Solder Alone
1	164	159	37
2	265	122	96
3	224	271	75
4	149	220	116
5	154	236	197
6	209	137	85
7	184	168	102
8	118	175	68
Mean	183	186	97
_ St Dev	47	51	47

TABLE 14

Summarized data can be found in Fig. 11.

Example 5:

		Tensile St	rength (N)	
Specimen	Solder + PLGA	Solder + SIS	Solder Alone	Suture
1	6.3	5.1	4.2	6.2
2	5.6	5.4	3.5	4.7
3	6.0	6.4	4.1	6.3
4	4.5	7.0	3.0	2.5
5	5.9	5.4	2.8	2.0
6	6.7	4.4	3.6	4.5
7	4.3	5.8	1.3	5.2
8	5.4	4.2	4.9	2.4
Mean	5.6	5.5	3.4	4.4
St Dev	0.8	0.9	1.1	1.7

TABLE 15

Summarized data can be found in Fig. 12.

	Time-to-Failure (s)									
Specimen	Solder + PLGA	Solder + SIS	Solder Alone	Suture						
1	96	86	47	65						
2	82	82	32	55						
3	90	90	51	95						
4	42	109	28	65						
5	86	78	22	60						
6	106	43	34	60						
7	47	87	11	55						
8	85	40	59	45						
Mean	79	77	36	63						
St Dev	23	24	16	14						

TABLE 16

Summarized data can be found in Fig. 13.

Example 6:

	PLG (irregu		PLG (smoo		SIS (irregi		SIS (smoo		Solder Alone		Native	
Aorta	T (N)	t (s)	T (N)	t (s)	T (N)	t (s)	T (N)	t (s)	T (N)	t (s)	T (N)	t (s)
1	1.20	70	0.83	36	1.44	74	0.77	16	0.64	42	1.53	84
2	1.23	69	0.79	41	1.27	65	0.70	39	0.32	15	1.65	72
3	1.08	71	0.76	36	1.37	69	0.60	27	0.59	18	1.41	63
4	1.29	80	0.70	15	1.44	79	0.66	24	0.62	48	1.93	121
5	1.33	83	0.64	32	1.37	63	0.61	31	0.48	11	1.58	90
6	1.35	84	0.86	48	1.35	62	0.98	46	0.87	59	2.04	74
7	1.26	91	0.95	62	1.12	58	0.94	32	0.64	41	1.62	82
8	1.00	72	0.87	47	1.32	64	0.80	23	0.69	40	2.17	134
9	1.23	76	0.50	19	1.09	57	0.89	48	0.60	33	1.42	63
10	1.40	86	0.98	57	1.20	61	0.87	51	0.57	21	1.62	121
Mean	1.24	78	0.79	39	1.30	65	0.78	34	0.60	33	1.70	90
St Dev	0.12	8	0.15	15	0.12	7	0.14	12	0.14	16	0.26	26

	PLG (irregi		PLC (smoo		SIS (irregi		SIS (smoo		Solder Alone		Native	
Small Intestine	T (N)	t (s)	T (N)	t (s)	T (N)	t (s)	T (N)	t (s)	T (N)	t (s)	T (N)	t (s)
1	0.91	59	0.60	38	0.96	36	0.63	24	0.44	16	1.16	94
2	0.79	50	0.71	42	0.92	39	0.74	28	0.52	23	1.42	82
3	0.84	58	0.85	48	0.84	37	0.80	36	0.37	13	1.36	93
4	1.00	65	0.58	32	0.86	42	0.72	26	0.50	11	1.11	45
5	0.90	55	0.55	35	1.03	46	0.54	18	0.66	27	0.58	76
6	0.75	51	0.51	30	0.90	43	0.46	14	0.48	14	1.24	89
7	0.78	49	0.60	42	0.95	39	0.40	7	0.27	7	0.68	77
8	0.90	51	0.32	28	0.83	32	0.49	15	0.22	6	1.24	56
9	0.94	59	0.43	31	0.88	36	0.55	18	0.41	26	0.77	86
10	0.83	52	0.49	35	0.80	_30	0.61	22	0.38	11	1.30	39
Mean	0.86	55	0.56	36	0.90	38	0.59	21	0.43	15	1.09	74
St Dev	0.08	5	0.15	6	0.07	5	0.13	8	0.13	8	0.30	20

	PLC (irregi		PLO (smo		SIS (irregi	-	SIS (smoo		Solder Alone		Native	
Liver	T (N)	t (s)	T (N)	t (s)	T (N)	t (s)	T (N)	t (s)	T (N)	t (s)	T (N)	t(s)
1	0.32	50	0.29	29	0.32	41	0.20	8	0.05	3	1.24	70
2	0.42	54	0.11	23	0.36	42	0.18	28	0.16	16	1.27	54
3	0.44	50	0.22	26	0.30	42	0.33	39	0.08	6	1.14	44
4	0.25	37	0.19	31	0.41	46	0.15	8	0.09	8	1.45	64
5	0.26	35	0.14	16	0.32	35	0.27	12	0.18	15	1.48	85
6	0.30	51	0.29	30	0.43	45	0.24	14	0.23	31	1.42	43
7	0.41	53	0.33	49	0.27	32	0.22	29	0.19	21	1.30	68
8	0.30	41	0.36	41	0.31	36	0.38	45	0.26	42	1.28	37
9	0.27	40	0.28	36	0.24	29	0.11	17	0.11	28	1.21	47
10	0.35	49	0.17	32	0.20	23	0.24	34	0.12	25	1.43	72
Mean	0.33	46	0.24	31	0.32	37	0.23	23	0.15	20	1.32	58
St Dev	0.07	7	0.08	9	0.07	7	0.08	13	0.07	12	0.12	16

	PLG (irregu		PL (smo	GA ooth)	SIS (irregu		SIS (smoo		Solder Alone		Native	
Spleen	T (N)	t (s)	T (N)	t (s)	T (N)	t (s)	T (N)	t (s)	T (N)	t (s)	T (N)	t (s)
1	0.72	61	0.43	35	0.63	52	0.41	31	0.26	16	0.90	58
2	0.57	52	0.63	61	0.59	49	0.47	33	0.21	14	1.18	70
3	0.62	60	0.57	48	0.65	55	0.53	42	0.36	27	1.52	83
4	0.65	61	0.51	40	0.60	53	0.57	44	0.43	31	0.97	45
5	0.69	68	0.79	49	0.62	57	0.51	41	0.32	24	1.46	77
6	0.61	52	0.46	37	0.74	58	0.44	22	0.48	36	1.06	49
7	0.63	54	0.41	34	0.69	42	0.46	17	0.51	32	1.04	63
8	0.70	62	0.48	32	0.72	57	0.50	33	0.32	18	0.69	60
9	0.68	59	0.40	23	0.59	40	0.55	45	0.26	12	1.33	67
10	0.64	55	0.38	27	0.65	48	0.56	39	0.24	14	0.84	41
Mean	0.65	58	0.51	39	0.65	51	0.50	35	0.34	22	1.10	61
St Dev	0.05	5	0.13	11	0.05	6	0.05	9	0.10	9	0.27	14

	PLG (irregi		PLC (smoo		SIS (irregu		SIS (smoo		Solder Alone		Native	
Lung	T (N)	t (s)	T (N)	t (s)	T (N)	t (s)	T (N)	t (s)	T (N)	t (s)	T (N)	t (s)
1	0.25	15	0.17	13	0.19	25	0.19	12	0.12	22	0.57	43
2	0.21	24	0.11	3	0.36	37	0.10	5	0.05	2	0.66	52
3	0.37	27	0.21	17	0.23	18	0.31	32	0.08	5	0.56	38
4	0.23	32	0.25	22	0.29	22	0.17	9	0.06	6	0.65	48
5	0.31	12	0.12	5	0.21	14	0.25	17	0.24	24	0.68	45
6	0.20	20	0.25	17	0.20	13	0.09	3	0.11	7	0.63	36
7	0.18	19	0.27	32	0.24	16	0.12	4	0.18	11	0.54	46
8	0.27	17	0.10	4	0.32	24	0.21	12	0.17	9	0.43	32
9	0.25	21	0.19	10	0.28	20	0.19	16	0.32	31	0.51	46
10	0.24	26	0.21	21	0.24	12	0.18	21	0.05	3	0.72	52
Mean	0.25	21	0.19	14	0.26	20	0.18	13	0.14	12	0.60	44
St Dev	0.06	6	0.06	9	0.06	7	0.07	9	0.09	10	0.09	7

TABLE 17

Summarized data can be found in Figs. 16 and 17.